DOCUMENT-IDENTIFIER: US 20010017732 A1

TITLE: Optical system and optical apparatus having the same

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Summary of Invention Paragraph - BSTX (21):

[0020] Also, in the optical system proposed in the above-mentioned Japanese Patent Application Laid-Open No. 09-258106, the downsizing the entire mirror optical system is achieved and yet the disposition accuracy, i.e., assembly accuracy, of the reflecting mirrors incidental to the mirror optical system is loosened, but there is only a single lens on the object side of the stop and it is immovable and therefore, to make F number constant during zooming, the diameter of the stop must be varied. If the F number is determined, the diameter of the stop is determined and therefore, when the size of image is small as in a still video camera, the diameter of a small stop necessarily becomes small. There also arises the problem that due to the cosine fourth power rule, the quantity of marginal light is greatly reduced. Also, all of the four elements constituting the optical system have negative optical power (optical power is the same meaning of the reciprocal number of the focal length), and this is not preferable in the correction of aberrations. Further, almost all of the surfaces constituting the third optical element which is a magnification changing portion have relatively strong positive power alone, and this is not preferable in the correction of aberrations.

Detail Description Paragraph - DETX (6):

[0036] Since the optical system according to the present embodiment is an off-axial optical system, the surfaces constituting the optical system has no common optical axis. So, in the present embodiment, an absolute coordinate system having the center of the first surface as the origin is first set. Also, the path of a ray of light (reference axis ray of light) passing through the origin and the center of the final imaging plane is defined as the reference axis of the optical system. Further, the reference axis in the present embodiment has a direction. The positive direction thereof is a direction in which the reference axis ray of light travels in case of imaging. However, as the axis which becomes the reference of the optical system, there can be adopted an axis convenient in optical design, in putting aberrations in order or in expressing the form of each surface constituting the optical system. Generally, however, the path of a ray of light passing through the center of the imaging plane, and the stop or the entrance pupil or the exit pupil or the center of the first surface of the optical system or the center of the last surface is set as the reference axis which is the reference of the optical system.

Detail Description Paragraph - DETX (87):

[0104] Also, at the wide angle end, the imaging magnification of the entrance pupil at the stop position is 0.28 time. When the stop is in front of the optical system, the size of the entrance pupil is directly the diameter of the stop, but in the present embodiment, the imaging magnification of the entrance pupil is thus set appropriately, whereby the diameter of the small stop is prevented from becoming extremely small.

Detail Description Paragraph - DETX (88):

[0105] Also, by adopting a construction in which the image of the stop is formed at a negative magnification by the optical system forward of the stop position, the effective diameter of the ray of light on each surface is restrained to a small level, and the compactness of each optical element and the entire photo-taking optical system is achieved.

Detail Description Paragraph - DETX (89):

[0106] As described above, in an optical system of the reflection type having at least one optical element designed such that two refracting surfaces and a plurality of reflecting surfaces are formed on the surface of a transparent body and a beam enters from a refracting surface into the interior of the transparent body and repeats reflection by the plurality of reflecting surfaces and emerges from another refracting surface, or at least one optical element designed such that a plurality of reflecting surfaces comprising a surface reflecting mirror are integrally formed and an incident beam repeats reflection by the plurality of reflecting surfaces and emerges, and including at least one coaxial refracting optical element comprised of one of the aforedescribed optical elements or only a refracting surface, in succession from the object side, a first optical element has negative optical power, a second optical element has positive optical power and a third optical element has negative optical power, and a stop is provided among these optical elements, whereby as compared with the case of a pre-stop, a reduction in the quantity of marginal light can be prevented and the diameter of the small stop can be prevented from becoming extremely small.

L Number	Hits	Search Text	DB	Time stamp
1	210258	(aperture or stop or diaphragm or iris) same (minimized or small$)	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2003/09/17 08:12
2	110316	(aperture or stop or diaphragm or iris) near12 (minimized or minimum or small$)	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2003/09/17 08:12
3	99	(off-axial$) adj3 (surface or reflect$)	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2003/09/17 08:20
4	12	((aperture or stop or diaphragm or iris) near12 (minimized or minimum or small$)) and ((off-axial$) adj3 (surface or reflect$))	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2003/09/17 08:18
5	3730	359/625-640.ccls.	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2003/09/17 08:19
6	256	((aperture or stop or diaphragm or iris) near12 (minimized or minimum or small$)) and 359/625-640.ccls.	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2003/09/17 08:19
7	29	(off-axial$) adj3 (curved or concave)	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2003/09/17 08:20

L Number	Hits	Search Text	DB	Time stamp
1	3700	359/628-641.ccls.	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2003/09/17 09:10
2	1820	(off-axial$) or (rotational$ adj2 asymmetr$)	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2003/09/17 09:31
3	135	359/628-641.ccls. and ((off-axial$) or (rotational$ adj2 asymmetr$)) and (aperture or stop or iris or diaphragm)	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2003/09/17 09:16
4	175	((off-axial$) or (rotational$ adj2 asymmetr$)) and (aperture or stop or iris or diaphragm) and (intermediate adj2 image)	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2003/09/17 09:27
5	3034	(aperture or stop or iris or diaphragm) and (intermediate adj2 image)	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2003/09/17 09:34
6	937	((off-axial$) adj3 curved) or (rotational$ adj2 asymmetr$)	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2003/09/17 09:51
7	137	((aperture or stop or iris or diaphragm) and (intermediate adj2 image)) and (((off-axial$) adj3 curved) or (rotational$ adj2 asymmetr$))	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2003/09/17 09:31
8	1125	((aperture or stop or iris or diaphragm) and (intermediate adj2 image)) and cameras	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2003/09/17 09:33
9	638	((aperture or stop or iris or diaphragm) and (intermediate adj2 image)) and (dust or noise)	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2003/09/17 09:33
10	129	((aperture or stop or iris or diaphragm) same (dust or noise)) and (intermediate adj2 image)	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2003/09/17 09:34
11	172	(((off-axial$) adj3 curved) or (rotational$ adj2 asymmetr$)) and (intermediate adj3 image)	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2003/09/17 09:52